

12. *Remove primary focus* as center of carbuncle, tubes in tubercular peritonitis, pustule in anthrax.

13. *Close cavities.*

Collapse pleural cavities, press together the walls of abdominal sinuses, or any granulating cavity. Bone cavities are hard to heal, as the ebonized shell of bone lining them is an effectual barrier to new growth.

14. *If gangrene, keep it dry*, as wet travels rapidly. Infected sloughs are best treated with strong carbolic acid or digested away with artificial gastric juice.

15. *Eliminate* by hydragogues, hot baths and plenty of water to drink.

15. *Build up vitality in general*, food, rest, baths, stimulants.

In the healing of wounds, the granulation tissue is not encouraged as well with straight balsam of Peru as with the balsam diluted with six parts of castor oil as it is far too strong, injures the tissue and increases discharge. The same applies to camphor-phenol and it gives much better results and allows better healing if diluted with five parts alboline. When granulations are hard and sluggish quick healing may be obtained by shaving off an eighth of an inch with a knife instead of using zinc chloride or silver nitrate. Strapping granulations will shape them, keep them down and stop discharge just as a plugging of bismuth paste stops discharge by its obliteration of all free surfaces. If walls of a granulating cavity are pressed together by deep sutures they usually unite.

To fill a granulating cavity, cut a piece off the wall so the cavity fills up full of blood and let this clot. Leave it so and each day or so let more blood flow into it so the cavity remains full. The blood nourishes the surface granulations, is anti-septic, does away with discharge by doing away with all free surfaces and acts as a framework into which the vessel loops and cell tendrils can extend and grow. A granulating surface is comparable to the under surface of a jellyfish: it is flat when out of water as its tentacles are directed along the surface, but when floating in water the jellyfish's tentacles extend out into the water freely and far-reaching. This is the way granulation tissue acts under a blood clot.

Skin edges will grow rapidly if directed across a denuded area by adhesive strapping or a crust. If 8% scarlet red be painted on them and an open compress of Lock's solution be applied new life will come into them. Approximating edges by adhesive or rubber-band traction saves time.

In case of *chronic infections* remove the barrier base. Use vitalizes a part. If infections are acute, use wet dressings, if a wound is no more infected it often heals more quickly and remains less infected if allowed to dry and heal under a crust.

Most acute infections and chronic ones are accompanied by inadequate inflammation and we should stir up more inflammation artificially. In the healing of most operative wounds there is adequate inflammation. Cases of excessive inflammation should have the excess of congestion relieved

(by puncturing, elevating, dehydrating and applying cold).

*When should we use cold and when heat?*

If a rabbit's ear be injected with pus germs, inflammation will result and eventual healing, but if the ear be first chilled by ice, there will be no inflammation but just necrosis as the tissue has been too de-vitalized by the cold to react.

By applying heat to inflamed tissue we provide a temperature as many degrees above the optimum temperature for germ growth as cold is below and we decrease the resistance of the tissues far less.

Cold decreases swelling better than does heat as it causes at first at least contraction of vessels and dispels venous stasis.

Cold is best used to dispel swelling in non-septic inflammation such as sprains or bruises and also the very painful swelling of encapsulated organs such as the teste. Used early in sprains it prevents joint effusion. It may be used to dispel the intense congestion of excessive inflammation to save the tissue from necrosis. Clinically, cold over an appendix has helped. This has been explained by there being a reflex dilatation of the deep vessels as the result of the contraction of the surface vessels. Except for these exceptions heat seems preferable to cold in infections.

#### THE USE OF THE LANE PLATES IN FRACTURES: REPORT OF FORTY-EIGHT OPERATIONS.\*

By FRED R. FAIRCHILD, M. D., Woodland.

Since the meeting of the Northern District Medical Society in Woodland one year ago, several of the members have done me the honor to suggest that they would like to hear further consideration of the paper, that I at that time read, on "The Open Treatment of Fractures, With Special Reference to the Use of the Lane Plates." I am the more ready to take the subject up again, since time prevented any discussion by the fellows present. Then I am glad of an opportunity to defend a method the results of which make me increasingly enthusiastic, while, at the same time I am aware that with many others, it is falling into disrepute.

In rereading my last year's paper I find it to be about as complete a statement of my present convictions as I am able to make. I can do no better than to give a résumé of that paper, with such additions as may be necessary to bring it up-to-date. Among these additions will be a brief classification of the forty-eight cases in which the method of Mr. Lane has been employed.

Appreciating the strides made in surgery since the beginning of anti- and aseptic technic, we should be ready to accept almost any additional possibility. But the compound fracture since the dawn of the healing art has commanded a respect born of fear and, even to-day, the attitude of the laity generally, and the profession largely, makes us slow in converting a simple into a compound

\* Read before the Northern District Medical Society, 1914.

fracture. This attitude is often responsible for imperfect results. We are demanding more of ourselves each year and effort that we counted good but yesterday we know to be bad to-day. Certainly we must accept this as true in regard to fractures. The X-ray has given us eyes to see, modern surgery has given us means to mend, and our own earnestness of endeavor should bring to us the skill to apply this new found knowledge to the perfect restoration of the majority of fractures.

It would be profitable to consider the various forms of direct mechanical support that may be applied to fractures. Time does not permit of this and, since I shall confine myself to discussing the use of the Lane plates, I would avoid being misunderstood by stating that I do not consider plating as superior always to other means of support. I do believe that both theoretically and practically, the majority of cases treated by the open method, will be best served by the use of the metal plates. Further I do not believe that any open operation should be done until honest and intelligent effort has been made to secure satisfactory reposition by the more conservative practice. If, after such endeavor, we are convinced that the result will be functionally imperfect or obvious deformity, duty to our patient and to ourselves should impel us to adopt other means that he may not go through life with a needless handicap.

You will accept the statement that, except for the fear of infection, we would cut down upon the majority of complete fractures. This would insure perfect reposition and anatomically and functionally the most nearly perfect results. It would guarantee, in very large measure, against nonunion which is often the result of the interposition of soft tissue between the opposing fragments, preventing the meeting of the osteoblasts.

If it be true, then, that the open method has so much to recommend it, it behooves us to consider very carefully the objections. We may conveniently classify them under the following heads:

The objections:

- a. Danger of infection.
- b. Possibility of irritation by the plate.
- c. Necessity for hospital treatment.

Our experience has been such as to make us feel practically the same security in bone as in abdominal work. Perfection in aseptic technic is a possibility. The more nearly we attain to it the further may we go in bone surgery. In this matter the personal equation enters. If we are finding pus in the trail of primarily clean work, something is wrong, and bone plating had best be left to some other fellow until you are sure you have found and corrected the error; otherwise grief will follow.

In our series of 48 cases we have had infection but once and, under the circumstances attending, I am sure you will not blame the method and I hope not the operator. In an automobile accident the patient sustained a fractured skull and a double fracture of the femur. He was rendered unconscious and never regained consciousness. A de-

compression operation was at once done. Six days later the thigh had become immensely swollen from constantly accumulating blood. In his delirious condition he could not be kept at rest. The result was gouging of the soft tissues by broken bones and continued oozing. Not knowing how else to stop this source of hemorrhage, we, under these most unfavorable circumstances, plated the femur in two places. Infection followed. What the result would have been I do not know since the patient died three days later from the head injury. I am not willing to accept this case as a count against bone plating for no one entirely sane would, from choice, use the open method under such circumstances.

The second objection is that the plates may irritate and have to be removed. Our records show that, except where we have used this method in some stage of a compound fracture (4 cases), we have removed but three plates in 48 operations. Two of these were applied immediately under the skin, over the prominence of the internal condyle of the humerus in patients who were very thin. The expressed preoperative intent was to remove these plates as soon as they had performed their function. The third case was one in which we had not anticipated the necessity of removal. The patient was 54 years old; a confirmed alcoholic and debilitated subject. The fracture was a spiral of the tibia with much comminution. Two plates were applied. Good union resulted with no shortening. After four months some irritation necessitated the removal of the plates under local anesthesia. Several subsequent dressings were required. This case caused us more annoyance than any other we have had but the ultimate results were all that we could have desired.

We have used plates in three cases of compound tibial fracture. They were applied in the most accessible places. The wounds were left open, the intent being to hold the fragments in proper position until sufficient callus had formed to enable us, with the aid of external splints, to retain a correct position until complete ossification. In each of these cases we succeeded in giving the patient a perfect functional result with *no* shortening. Our experience compels us to insist that the objection of "subsequent irritation" is not a valid one and further to maintain that, if the application of a plate will give functionally or cosmetically a better result, the inconvenience and discomfort of its removal should be cheerfully accepted.

The last objection is that the work must be done in a hospital. This may work a temporary embarrassment, but, if it prevents a permanent disablement, that can not be taken into consideration. The objection is rarely insurmountable but, if it is so, the conservative plan had best be followed, no matter what the indications. It is a very bold or very foolish surgeon who opens up a fracture except under conditions of his own choosing.

So much for the objections to the use of the Lane plates. Let us consider the advantages.

- a. It is possible to secure and retain perfect apposition.

b. The patient need be confined to bed but a few days.

c. By this method there is the minimum of suffering.

We need spend but little time on the first of the advantages mentioned. It is possible with greater or less ease, depending on the skill of the operator, to replace the fragments in exact position and to hold them there. This means the minimum of callus, a factor of vital importance if the fracture involve a joint. Why are so many patients who have sustained a Potts fracture sufferers afterward? Not because, as they are so frequently told, there are adhesions in the joint, but because the fragments were not perfectly replaced, or, if so replaced, were not held absolutely immobile and as a result not adhesions but callus is in the joint. I know of no mechanical means that gives the absolute fixation of a plate with two or more screws at each end. Near a joint it may not be possible to have more than one screw on the end of the short fragment but, fortunately, in this position but one screw is needed, since the motion of the joint relieves the fracture of the strain to which it would be subjected were it farther away.

Perfect reposition of the fragments is the best guaranty against nonunion. Soft tissue intervening, particularly periosteum, may cause a fracture apparently well set to remain movable. This may happen only occasionally, but when it does occur it is an annoying complication and one that may lead to a great deal of embarrassment.

We suggest as a second advantage that the patient can be about in two or three days, and this is a factor the importance of which is commonly overlooked. Fractures occur most frequently in those of an active habit. The tibial fracture is common to the laboring man, and it is the one we most dread by reason of its disinclination at times to unite. The reasons for trouble with this bone are several. By the usual method of treatment it means weeks in bed for a man habitually active. And this is not all; it means the discomfort of a heavy extension weight; the pain of slipping fragments, all of which, combined, depress the patient to the point where his vitality is not sufficient to enable him to supply the material necessary to repair. The not infrequent result is non-union. Contrast this history with that of the patient who has had the fracture plated. The position is correct. The fragments can not slip and there is no pain. He is about on crutches; out in the fresh air gaining the encouragement and vitality which come with freedom and exercise. Under such circumstances we may expect union where otherwise we might fail.

We suggested that, in the third place, by repair of a fracture with the plate there would be the minimum of pain. Above we mentioned the element of suffering as a deterrent factor in union. At best, a broken bone is a painful proposition and usually the pain does not cease with the operation of setting the bone. Every voluntary motion or involuntary muscular spasm causes slipping of the fragments and consequent agony. This plus the misery attendant on extension and confinement

makes the condition well nigh unbearable. I think if patients knew that this is largely unnecessary we would be compelled to use Mr. Lane's plates more frequently than we are now doing.

Finally a few words in relation to technic may be in order. It probably does not differ materially from the methods employed by others of you, but the experience of each is valuable to the others, and I hope that I may in turn get many points from the discussion that I trust will follow.

The incision should be generous. With a wide field the manipulation becomes easy and the sum total traumatism is greatly reduced.

The knife used to make the skin incision should be laid aside and not subsequently used. We have no guaranty that in one of the deep skin glands a colony of pyogenic bacteria may not have been encountered. It is needless to risk spreading them.

When the incision reaches the deep fascia, towels should be stitched to it so that the skin will not again be seen until time to close the skin wound.

All manipulations should be made with instruments, if one would follow the tenets of Mr. Lane. I am free to confess that, until quite recently, I have been unable to do the work in this way. Gloves may be as thoroughly sterilized as instruments, but gloves may be torn on the sharp fragments. To avoid this danger I have been accustomed to using, for this work, heavy household gloves. The reason for my former inability to use instruments alone, I have determined to have been too small an incision.

Plates selected from the stock set are often needlessly heavy. Use as light a plate as is consistent with safety. We have had many plates made from heavy clock spring. They were exactly the size and shape desired, having been fashioned after a paper pattern previously fitted to the corresponding part on a skeleton, after the X-Ray had shown us exactly what character of support would be desired.

The screws should be very slightly larger than the point of the drill and the same taper. A screw a fraction too large will split the bone. This is a disaster. A screw a trifle too small will not be firm and either displacement or over production of callus will be the result.

Generally speaking the plate should be placed as deeply under a cushion of soft tissue as possible. This is the best safeguard against irritation. However, we do not hesitate to apply the plate immediately under the skin if by so doing we get better apposition or materially reduce the operative traumatism. The splint so placed will almost surely have to be removed. But the objection to removal is infinitely less than the objection to unnecessary violence to the soft tissues or to poor apposition.

Control all bleeding points without ligation if possible.

Drain away the oozing that may occur for 24 hours with a few strands of silkworm gut.

Close the skin with clips. I believe that a needle carried through the skin to the fat, which is at best poorly supplied with blood, or to a small hematoma that may have collected, invites infection and in bone work certainly is bad surgery.

For external dressing we use felt. It is light; easily removed for dressing or examination and answers every requirement.

Get the patient up as soon as possible.

At the present time we are hearing much of the bone graft and its use as a splint in the repair of fractures. Is it going to prove a more reliable procedure than plating? I think not and the belief is based on the following reasons:

1st. Its application is more limited.

If a fracture is near a joint it is essential that the fragments be placed in exact position and held firmly in place. If there is not exact reposition or if the fragments move even slightly during the process of repair there will be excessive callus and an impaired joint. I do not believe that any bone splint will accomplish these two necessary conditions as will the Lane plate.

The bone splint is necessarily more or less frail. It could not be relied on to retain position under stress. If the fracture, for example, were high in the shaft of the femur the danger of failure by the splint breaking would be considerable, for in this position the support by the external splints is unreliable. The Lane plates on the other hand will sustain a remarkable amount of violence without failing.

2nd. The danger of infection is not less.

Bone splinting is a procedure accompanied by more traumatism than plating. In some cases two incisions are necessary. The danger of infection is not decreased, for your graft is no more certainly sterile than is your plate.

In selected cases, as in un-united fractures, the repair of small bones, or the repair of large bones where it is possible by external splints, be sure of retaining position of fragments, bone splinting will become popular, but I believe that the pendulum will again swing, making the method of Lane the operation of choice in the great majority of cases.

There have been eight fractures of the shaft of the femur plated. There have been seven perfect results. The eighth died on the 3rd day from the effect of the fractured skull.

There have been eight cases of fracture of the lower end of the humerus involving the articular surface of the elbow joint. Two of these were old fractures with union in malposition. Of these one has an anatomical and functional perfect result; the other has very slight limitation of flexion. The other six are practically perfect.

Two cases of fracture of the lower jaw at the angle were plated. These patients had, following the operation, no other support to the fracture than that given by the Lane plate. They were at once allowed to masticate soft food. They had no subsequent pain. In one the result was perfect. In the other I was guilty of overlooking a longitudinal fracture of the alveolus that subsequently made me some trouble, but the result to the fracture plated was perfect.

Three cases of non-union have been plated with union in each case.

Three compound fractures have been plated, the

plates being subsequently removed. The result in each case has been perfect.

Total number of fractures during interval from which these cases have been drawn, 205.

#### Summary.

1910.		
Fractures plated:		
Compound	1	Of the two simple fractures
Simple	2	neither case has made complaint.
	—	The plates have never been removed.
Total	3	
1911.		
Compound	1	Of the simple fractures six are
Simple	7	still in place and have given no
	—	trouble. The seventh was a
Total	8	Potts, in a man with bad varicose veins. Removed plate after expressed preoperative intent.
1912.		
Compound	0	No plate has been removed or
Simple	17	caused subsequent trouble. One
	—	patient, aged 63, after two
Total	17	months (fractured femur) with apparently perfect result died of abscess of the lung. Another had leg subsequently amputated for preexisting bone disease. At time op. was told amp. would surely be necessary.
1913.		
Compound	1	Of these two were removed
Simple	10	after expressed preoperative intent and one where removal
	—	had not been anticipated.
Total	11	
1914.		
Compound	0	All in good condition, but too
Simple	9	soon to draw conclusions. No
	—	plates removed. No irritation
Total	9	from any plate.
Grand total	48	

#### GAS BACILLUS INFECTION.\*

GILBERT M. BARRETT, M. D., San Francisco.

If one presents something before this learned body which boasts absolute novelty it may enjoy a hearing justified by its newness; if it is something old, trite and not in a new dress it has the advantage of old friendship; if it lies between these, being neither so rare that it is not met with, nor yet so common as to be threadbare, it merits at least the consideration accorded acquaintanceship if not friendship.

In bringing to your notice this subject of gas bacillus infection I have gone over the material previously reported in the literature, so far as possible.

No fewer than eleven appellations have been employed for this gas bacillus infection and the organism causing it. Since 1892 when Welch identified and described it, the bacillus now known as the B. A. C. has been accepted, in America at least, as the organism principally concerned in the production of gas in human tissues, living or dead. In this article we are referring to the B. Welchii only, and not to any other anerobe of this group.

We are not trying to differentiate between this organism and others of the same group, known by other names in other countries, nor are we

\* Read before the San Francisco County Medical Society, October, 1914.